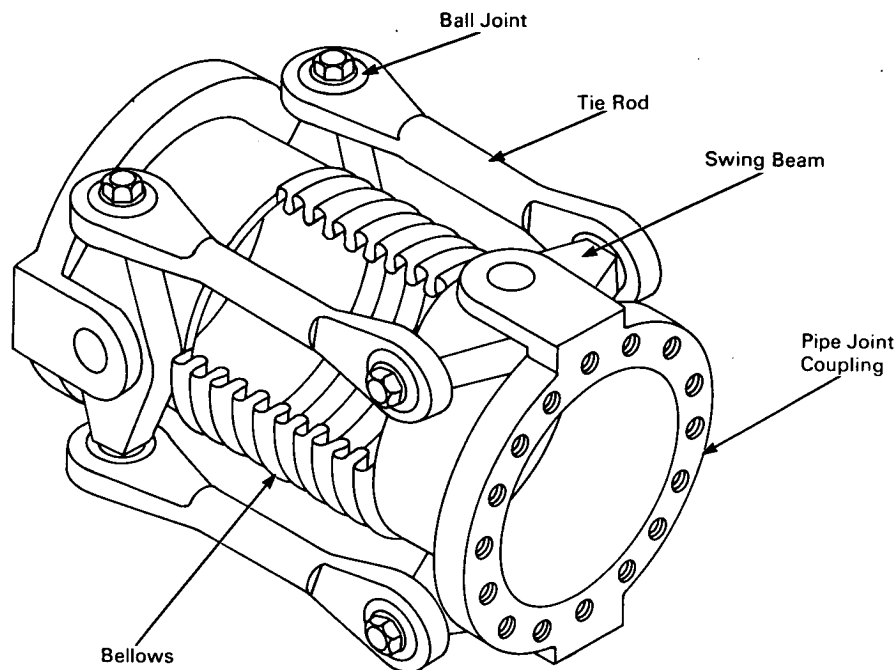


NASA TECH BRIEF



NASA Tech Briefs are issued by the Technology Utilization Division to summarize specific technical innovations derived from the space program. Copies are available to the public from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151.

Universal Bellows Joint Restraint Permits Angular and Offset Movement



The problem: To design a restraint that will permit maximum angular and lateral-offset movement in a bellows joint without danger of rupture or pressure drop in the line. Restraints using internal cables and pressure-compensated devices cause line pressure losses and are cumbersome and expensive to fabricate.

The solution: A universal joint-type restraint that employs ball joints to permit freedom of motion of the restrained members both as to angulation and offset.

How it's done: The restraint operates by means of swing beams that are mounted on pipe joint couplings in such a way that they are free to turn through appreciable arcs, each end free to move orthogonally

with respect to the other. The beams are joined by four tie rods that mate with them by means of ball joints.

Notes:

1. By using longer tie rods, the joint could accommodate two bellows joined by a center tube.
2. In angular motion of the bellows the center point may occur at any point between the sets of swing beams.
3. This restraint could be used in high-pressure and high-temperature applications in refineries, steam plants, or stationary powerplants.

(continued overleaf)

Patent status: Title to this invention has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)), to North American Aviation, Inc., 1700 East Imperial Highway, El Segundo, California, 90246.

Source: Ralph F. Kuhn, Jr. of North American Aviation, Inc. under contract to Western Operations Office (WOO-102)